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Report No. 8926-137

Material - Adhesives - Structural - Protective Tapes for Effect of Tapes on Structural Adhesive Strength

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Material - Adhesives - Structural - Protective Tapes for

Effect of Tapes on Structural Adhesive Strength

Abstract:

The effect of applied Minnesota Mining and Manufacturing Co. Tape #347 on the tensile shear strength of adhesive bonded joints comprised of Minnesota Mining and Manufacturing Co. EC 1290 and AF 10 structural adhesive components was determined. The specific effect observed related to the effect of tape application and storage on precured EC 1290 primer. The protective tape consisted of paper backing to which rubber base adhesives are applied. No significant change in adhesive bond strength was caused by 3M Tape #347 after upwards to 160 days with it in contact with precured EC 1290 primer.

Reference: Lintvedt, V. L., Picotte, G. L., Reschan, R. R., "Protection of EC 1290 Adhesive Primed Metal Surfaces with 3(M) Co. Tape 347," General Dynamics/Convair Report MP 58-095, San Diego, California, 1 October 1958 (Reference attached).

STRUCTURES-MATERIALS LABORATORIES

CONVAIR
A DIVISION OF GENERAL DYNAMICS CORPORATION
SAN DIEGO

REPORT MP-58-095
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TITLE

REPORT NO. MP-58-095

PROTECTION OF EC-1290
ADHESIVE PRIMED METAL
SURFACES WITH 3 (M)CO.
TAPE 347

Manufacturing Development
P.R. #843

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Report No. MP-58-095
Protection of EC-1290
Adhesive Primed Metal
Surfaces with 3 (M)Co.
Tape 347

INTRODUCTION:

Prior testing of Tapes 343 and 344 indicated the feasibility of protecting adhesive primed surfaces with special protective tapes. A new tape was recommended for this purpose by Minnesota Mining and Manufacturing Co., No. 347. The above mentioned 343 and 344 tapes have natural colored kraft paper backing. The black colored kraft paper backing of the 347 should prevent mistaking this material for an adhesive film.

The tape 347 is .005 inch thick so that mock assemblies can be accomplished with the two layers of tape simulating the .010 inch thick adhesive AF-10 film.

OBJECT:

To determine whether tape 347 manufactured by Minnesota Mining and Manufacturing Co. is satisfactory for protection of EC 1290 primed aluminum alloy surfaces for periods up to 160 days storage.

CONCLUSIONS:

It is concluded that tape 347 affords satisfactory protection for EC-1290 primed surfaces for "open assembly" time or storage time.

RECOMMENDATIONS:

1. It is recommended that EC-1290 primed surfaces be protected with tape 347 whenever parts are not assembled with an adhesive film immediately after precuring.

2. It is further recommended that tape 347 be tested on other adhesive primer systems.

DESCRIPTION OF SPECIMEN:

Material:	Tensile Shear Specimen .063"x4"x9" 2024-T3 Alclad
Peel Specimen:	.020"x1"x9" 2024-T6 Alclad
Tape:	AF-10 Lot 77
Surface Preparation:	Alodized in accordance with MPS 46.07C

TEST PROCEDURE:

Specimens were alodized, brush primed, and precured at 200°F for 30 minutes. The controls were bonded immediately and the rest of the groups were covered with tape 347 for various periods of storage. To accelerate the tests, two test groups were placed in the sun during the day and taken in during the night.

Storage periods and exposure to sun or fuel are listed in Table I.

All specimens were bonded at 320°F for 1 hr. at 100 psi. The tensile shear testing was accomplished with a Tinius-Olsen tester for room temperature tests and equipped with a tank adapter to provide -67°F and 180°F test temperatures. The Materials and Processes Lab peel tester was used to measure the peel resistance of the 1"x9" specimen.

RESULTS:

Primed surfaces exposed to the sun turned brown in areas not covered by the 347 black protective tape. No change in color was noted in the area of the prime protected by tape 347.

The tape adhered well enough to afford protection during ordinary handling. It prevents dust from collecting on the faying surface. In comparison, the polyethylene strips used in some manufacturing areas do not seal out dust from primed surfaces.

The results of tests listed in Table I do not indicate any significant change in bond strength after various storage periods.

TABLE I

Controls Tensile shear +180° F test psi	Controls Tensile shear Room Temp. psi.	Controls Tensile shear -67° F psi.	Peel Room Temp lbs/inch
1450	3600	2240	57
1700	3340	2270	52
1810	3100	1870	51
1390	3800	2050	57
1540	3730	2040	
1660	3470		
1630			
Ave 1597	Ave 3507	Ave 2094	Ave 54

60 days total storage (20 days sunlight)

Tensile shear +180° F	Tensile shear Room Temp.	Tensile shear -67° F.	Peel Room Temp. lbs/ inch
1500	3340		
1440	3640	2250	41
1800	3390	2400	50
1690	3970	3960	53
1630	3780	2360	56
1670	3850	2070	
1610	3700	2220	
		2330	
Ave 1620	Ave 3667	2910	Ave 50
		Ave 2562	

160 days storage

+180° F	Tensile Shear Room Temp.	-67° F.	Peel Room Temp. lbs/inch
1450	3880	2230	
1650	3750	2290	49
1500	3980	1930	52
1750	3950	2420	54
1820	3700	2120	51
1820	3930	2080	
1540	4040	2250	
1770			
1630			
1700			
1420	Ave 3890	Ave 2189	Ave 52
1630			
1820			
1940			
Ave.1674			

TABLE I (cont'd)

160 days storage and 7 days immersion in Jp4 at 120° F
Tensile Shear

Room Temp.	-67° F.
3930	2400
3970	2200
3900	2100
3820	2100
Ave 3905	2460
	2010
	2010
	2300
	Ave. 219%